

# Genetic, Anatomical, and Functional Factors in the Formation of Retention of the Upper Teeth and Cutters

*Elmurodova Gulira'no Zokirjon kizi*

*Department of Pediatric Stomatology, Samarkand State Medical University*

*Ahrorova Malika Shavkatovna*

*Candidate of Medical Sciences, Associate Professor*

*Department of Pediatric Stomatology, Samarkand State Medical University*

**Abstract:** Retention of the upper canines and incisors is a complex multifactorial pathology of the dentoalveolar system, characterized by a disruption of the physiological eruption of teeth at normal stages of their formation and development. According to modern research, the frequency of upper molars retention varies from 0.8% to 2.8% in the population, while upper molars retention occurs in 0.1-0.8% of cases. The canines of the upper jaw have the longest eruption pathway among all permanent teeth, making them the most vulnerable to retention. The eruption of the upper canines occurs at the age of 11-13, with their nuclei forming high in the alveolar process, close to the pear-shaped aperture, and during development, they undergo complex migration to the final location in the dental arch.

**Keywords:** dental retention, upper canines, incisors, genetic factors, anatomical features, functional disorders, orthodontia, diagnostics.

## Introduction

Retention of the upper incisors, although less common, has no less important clinical significance, as it significantly affects the aesthetics of the frontal part of the dental arch and the functional capabilities of the dentoalveolar system. The central incisors of the upper jaw emerge at 7-8 years old, the lateral ones at 8-9 years old, and any disruption of this process can lead to serious functional and aesthetic problems.

The etiopathogenesis of upper anterior teeth retention is multifactorial and includes the interaction of genetic predispositions, anatomical features of the maxillofacial region structure, and functional disorders of the dentoalveolar system. Understanding the role of each of these factors is of fundamental importance for developing effective methods of prevention, early diagnosis, and treatment of this pathology.

Modern achievements in molecular genetics, radiation diagnostic methods, and functional diagnostics of the dentoalveolar system open up new possibilities for studying the mechanisms of retention formation and developing personalized approaches to treating patients with this pathology.

Familial aggregation of dental retention cases indicates a significant role of genetic factors in the development of this pathology. Studies show that the risk of retention in children whose parents had a similar problem increases by 2.4-3.7 times compared to the general population.

Analysis of the genealogy of families with multiple cases of retention revealed an autosomal dominant type of inheritance with incomplete penetration and variable expressiveness. This explains the varying severity of the pathology in members of the same family and the possibility of "passing" generations.

Modern studies have identified several candidate genes associated with the development of dental retention:

MSX1 (Muscle segment homeobox 1) is a key gene in dental development, whose mutations lead to a disruption in the formation of dental buds and their migration.

PAX9 (Paired box 9) is a transcription factor regulating odontogenesis, whose polymorphisms are associated with dental developmental anomalies.

AXIN2 is a gene involved in the Wnt signaling pathway, which is critical for the development of the dentoalveolar system.

TBX1 is a gene encoding the T-box transcription factor, mutations of which are associated with craniofacial developmental abnormalities.

Epigenetic regulation of gene expression through DNA methylation, histone modification, and non-coding RNA plays a significant role in odontogenesis processes. Disruptions in epigenetic mechanisms can lead to changes in the expression patterns of genes that control the development and emergence of teeth.

### **Anatomic factors**

#### Structural features of the upper jaw

The anatomical characteristics of the upper jaw significantly influence the process of eruption of the upper canines and incisors:

Maxillary sinus size - Enlarged sinus size may limit the space for normal tooth migration.

Thickness of the alveolar process - insufficient bone tissue thickness in the eruption area can be an obstacle to normal tooth movement.

Bone structure architecture - the structural features of bone partitions and the density of bone tissue influence the resistance of tissues during tooth eruption.

#### Local anatomical obstacles

Supercomplete teeth are one of the most common causes of upper incisors retention. Meziodens (supercomplex tooth between the central incisors) occurs in 0.15-1.9% of cases and can block the emergence or change the direction of incisors' growth.

Odontogenic cysts of various etiologies can mechanically prevent teeth from emerging or change their position in bone tissue.

Ankylosis of milk teeth - the fusion of a milk tooth root with the alveolar bone hinders its physiological resorption and can block the eruption of a permanent tooth.

#### Lack of space in dental arch

A deficiency in the dental row is a key factor in the development of retention. The reasons for lack of space include:

- Upper jaw micrognathia
- Macrodonatia (increased tooth size)
- Early removal of milk teeth with subsequent displacement of adjacent teeth
- Disruption of tooth and jaw size ratio

### **Functional factors**

#### Chewing disorders

The decrease in chewing load in modern nutrition conditions leads to insufficient development of jaw bones and, consequently, to a lack of space for teeth to emerge. Consumption of mostly soft, heat-treated food does not provide the necessary stimulation of jaw growth.

#### Temporomandibular joint dysfunctions

CNH functional disorders can affect the eruption processes of teeth through changes in the biomechanics of the dentoalveolar system and disruption of normal occlusal relationships.

#### Oral breathing

Chronic impairment of nasal breathing leads to a change in the position of the tongue, impairment of lip and cheek function, which can negatively affect the development of the upper jaw and create conditions for the development of retention.

#### Bad habits

Nursing a finger, pistils, and using a bottle for feeding for extended periods can lead to deformities in the dental rows and jaws, creating prerequisites for the development of dental retention.

### **Interaction of factors**

The development of retention of the upper canines and incisors is rarely caused by the action of a single isolated factor. Most often, a complex interaction of genetic predispositions, anatomical features, and functional disorders is observed.

Genetically determined structural features of the dentoalveolar system can be exacerbated by unfavorable functional factors, such as nasal breathing disorders or harmful habits. In turn, functional disorders can lead to secondary anatomical changes that create additional obstacles for tooth eruption.

#### Clinical methods

Early detection of retention development risk factors includes:

- Careful collection of family history
- Evaluating the timing of milk tooth eruption
- Analysis of tooth and jaw sizes
- Identification of harmful habits and functional disorders

#### Radiation diagnostic methods

Orthopantomography allows for the assessment of the presence of permanent tooth buds, their position and developmental stage, and the identification of supernumerary teeth and pathological formations.

Conical-radial computed tomography (CLCT) provides three-dimensional visualization of the dentoalveolar system and allows for accurate determination of the position of retinue teeth, their relationship to adjacent structures, and treatment planning.

### **Genetic testing**

Molecular genetic studies allow for the identification of mutation carriers in candidate genes and assess the risk of retention development in children from high-risk families.

#### Preventive measures

- Genetic counseling for families with a complicated medical history
- Early orthodontic observation of children in the risk group
- Correction of functional disorders
- Oral cavity sanitation and timely treatment of milk teeth

- Prevention of harmful habits

#### Treatment approaches

Conservative treatment involves creating a place in the dental arch using orthodontic appliances and stimulating eruption.

Surgical treatment involves removing mechanical obstacles (removal of supernumerary teeth, cysts), exposing the crown of a retained, and moving it orthodontically.

Combined treatment combines surgical and orthodontic methods to achieve optimal results.

#### Findings

1. The formation of the retention of the upper canines and incisors is the result of a complex interaction of genetic, anatomical, and functional factors.
2. Genetic predisposition plays a key role in the development of retention, which is confirmed by the family aggregation of cases and the identification of candidate genes.
3. The anatomical features of the upper jaw structure, the presence of local obstacles, and the lack of space in the dental arch are the main local factors in the development of retention.

#### References

1. Becker A., Chaushu S. Etiology of maxillary canine impaction: A review // American Journal of Orthodontics and Dentofacial Orthopedics. - 2015. - Vol. 148, No. - P. 557-567.
2. Bondemark L., Tsiopa J. Prevalence of ectopic eruption, impaction, retention and agenesis of the permanent second molar // The Angle Orthodontist. - 2007. - Vol. 77, No. - P. 773-778.
3. Celikoglu M., Kamak H., Oktay H. Investigation of transmigrated and impacted maxillary and mandibular canine teeth in an orthodontic patient population // Journal of Oral and Maxillofacial Surgery. - 2010. - Vol. 68, No. 5. - P. 1001-1006.
4. Fleming P.S., Scott P., Heidari N., DiBase A.T. Influence of the radiographic position of ectopic canines on the duration of orthodontic treatment // The Angle Orthodontist. - 2009. - Vol. 79 No. - P. 442-446.
5. Grisar K., Luyten J., Preda F., Martin C., Hoppenreijts T., Politis C., Jacobs R. Interventions for impacted maxillary canines: a systematic review of the relationship between the initial canine position and treatment outcome // Orthodontics & Craniofacial Research. - 2021. - Vol. 24, No. - P. 180-193.
6. Kim Y., Hyun H.K., Jang K.T. Interrelation between the position of impacted maxillary canines and the morphology of the maxilla // American Journal of Orthodontics and Dentofacial Orthopedics. - 2012. - Vol. 141, No. 5. - P. 556-562.
7. Lindauer S.J., Rubenstein L.K., Hang W.M., Andersen W.C., Isaacson R.J. Canine impaction identified early with panoramic radiographs // Journal of the American Dental Association. - 1992. - Vol. 123, No. - P. 91-97.
8. Peck S., Peck L., Kataja M. The palatally displaced canine as a dental anomaly of genetic origin // The Angle Orthodontist. - 1994. - Vol. 64, No. 4. - P. 249-256.
9. Power S.M., Short M.B. An investigation into the response of palatally displaced canines to the removal of deciduous canines and an assessment of factors contributing to favorable eruption // British Journal of Orthodontics. - 1993. - Vol. 20, No. - P. 215-223.
10. Sajjani A.K., King N.M. Early prediction of maxillary canine impaction from panoramic radiographs // American Journal of Orthodontics and Dentofacial Orthopedics. - 2012. - Vol. 142, No. - P. 45-51.